

CLAIMS

What is claimed is:

- 1 1. A method for analyzing particle systems using polarized scattered light, said method
 2 comprising the steps of:
 3 providing models of multiple particle systems of dipoles;
 4 performing ray-trace analysis with respect to the models over a range of scatter angles,
 5 the ray-trace analysis involving only use of second-order rays;
 6 receiving information corresponding to a particle system of interest; and
 7 predicting at least one characteristic of the particle system of interest using information
 8 generated during the ray-trace analysis.
- 1 2. The method of claim 1, wherein, in performing ray-trace analysis, constructive
 2 interference of the second-order rays is considered.
- 1 3. The method of claim 1, wherein, in performing ray-trace analysis, information
 2 corresponding to polarization state at near-back-scatter angles is generated for each of the
 3 models.
- 1 4. The method of claim 1, wherein providing models of multiple particle systems comprises
 2 the step of:
 3 providing a model for each of multiple values of a separation parameter (l) for a selected
 4 particle size.
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1 5. The method of claim 1, wherein:
2 the method additionally comprises the step of:
3 providing a memory storage device; and
4 the information generated during the ray-trace analysis is stored in the memory storage
5 device.

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1 6. The method of claim 5, wherein predicting at least one characteristic of the particle
2 system of interest comprises the steps of:
3 accessing the information stored in the memory storage device;
4 comparing the information corresponding to the particle system of interest to the
5 information accessed to determine which model most closely corresponds to the particle system
6 of interest.

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1 7. The method of claim 6, wherein, in comparing the information corresponding to the
2 particle system of interest to the information accessed, the minimum values of polarization state
3 versus back-scatter angles are compared.

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1 8. The method of claim 1, wherein:
2 the method additionally comprises the step of:
3 detecting values of TM and TE at various back-scatter angles with respect to the
4 particle system of interest; and
5 the information received corresponds to the values of TM and TE detected.

1 9. A method for analyzing particle systems using polarized scattered light, said method
2 comprising the steps of:
3 calculating relationships between polarization states and back-scatter angles with respect
4 to multiple arbitrary particle systems;
5 receiving information corresponding to a particle system of interest;
6 correlating the information received with the relationships calculated to determine a best
7 fit based, at least in part, on a minimum value of the polarization state of the particle system of
8 interest; and
9 using the best fit to estimate at least one characteristic of the particle system of interest.

1 10. The method of claim 9, wherein, in calculating relationships, at least one of the multiple
2 arbitrary particle systems is a cloud of dipoles.

1 11. The method of claim 10, wherein the cloud of dipoles is randomly distributed.

1 12. A computer-readable medium having a computer program stored thereon, the computer
2 program being executable to perform computer-implemented method steps, said method steps
3 comprising:

4 receiving information corresponding to a model of a distributed system of dipoles;
5 generating information corresponding to polarization state and back-scatter angle of the
6 model at multiple separation parameters (I) using second-order ray-trace analysis;
7 receiving information corresponding to a particle system of interest; and
8 predicting at least one characteristic of the particle system of interest using the
9 information generated.

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1 13. The computer-readable medium of claim 12, wherein the method step of generating
2 information comprises the step of considering constructive interference of second-order rays.

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1 14. The computer-readable medium of claim 12, wherein the method step of predicting at
2 least one characteristic of the particle system of interest comprises the steps of:
3 comparing the information corresponding to the particle system of interest to the
4 information generated; and
5 determining which separation parameter most closely corresponds to the particle system
6 of interest based on the comparing step.

1 15. The computer-readable medium of claim 14, wherein the method step of comparing the
2 information corresponding to the particle system of interest to the information generated, the
3 minimum values of polarization state versus back-scatter angles are compared.

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1 16. A computer-readable medium having a computer program stored thereon, the computer
2 program being executable to perform computer-implemented method steps, said method steps
3 comprising:
4 calculating relationships between polarization states and back-scatter angles with respect
5 to multiple arbitrary particle systems;
6 receiving information corresponding to a particle system of interest;
7 correlating the information received with the relationships calculated to determine a best
8 fit based, at least in part, on a minimum value of the polarization state of the particle system of
9 interest; and
10 using the best fit to estimate at least one characteristic of the particle system of interest.

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1 17. The computer-readable medium of claim 16, wherein, in calculating relationships, at least
2 one of the multiple arbitrary particle systems is a cloud of dipoles.

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1 18. The computer-readable medium of claim 16, wherein the cloud of dipoles is randomly
2 distributed.

1 19. A system for analyzing a particle system using polarized scattered light comprises:
2 a model of multiple dipole particle systems, the model being configured to provide
3 information corresponding to polarization state and back-scatter angle of the multiple dipole
4 particle systems at multiple separation parameters (l) using second-order ray-trace analysis; and
5 a computer operative to access the model, the computer being further operative to:
6 receive information corresponding to a particle system of interest; and
7 predict at least one characteristic of the particle system of interest using the
8 information provided by the model.

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1 20. The system of claim 19, further comprising:
2 means for storing the model such that the model is accessible by the computer.